# Current activities on land data assimilation for ALADIN at Météo-France

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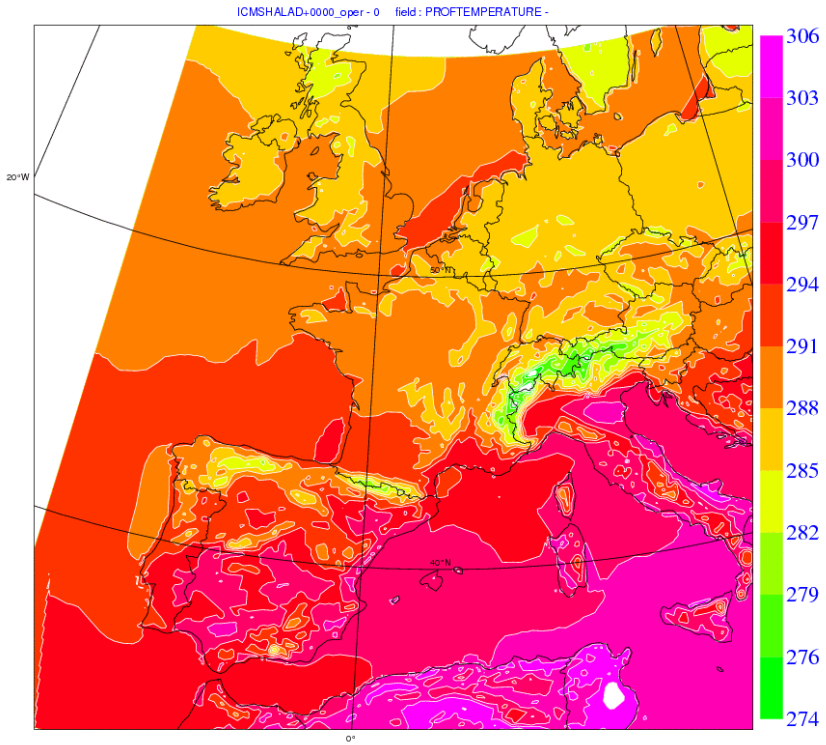
# Summary of developments

- CANARI OI soil analysis in ALADIN-France
- OI soil analysis in SURFEX
- EKF soil analysis in SURFEX
- Surface albedo analysis for ALADIN models

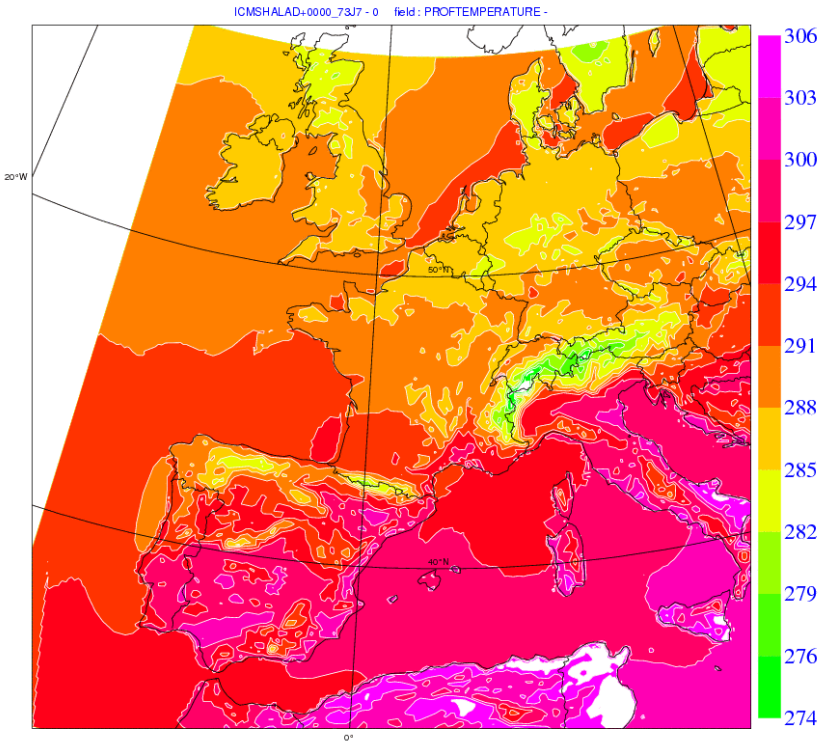
# OI CANARI soil analysis in ALADIN-France

- Tuning of screen-level CANARI OI analysis (T2m and RH2m) : ARPEGE choices for correlation length scales and observations and background variances
- First experimental set-up for August 2008 (one-month 3D-Var assimilation)
  - SST analysis with climatological relaxtion
  - Soil analysis (temperature and moisture content) without climatological relaxation
  - Soil analysis set-up parameters similar to ARPEGE

# Deep soil temperature analysis




EXP




OPER

After one month of analysis

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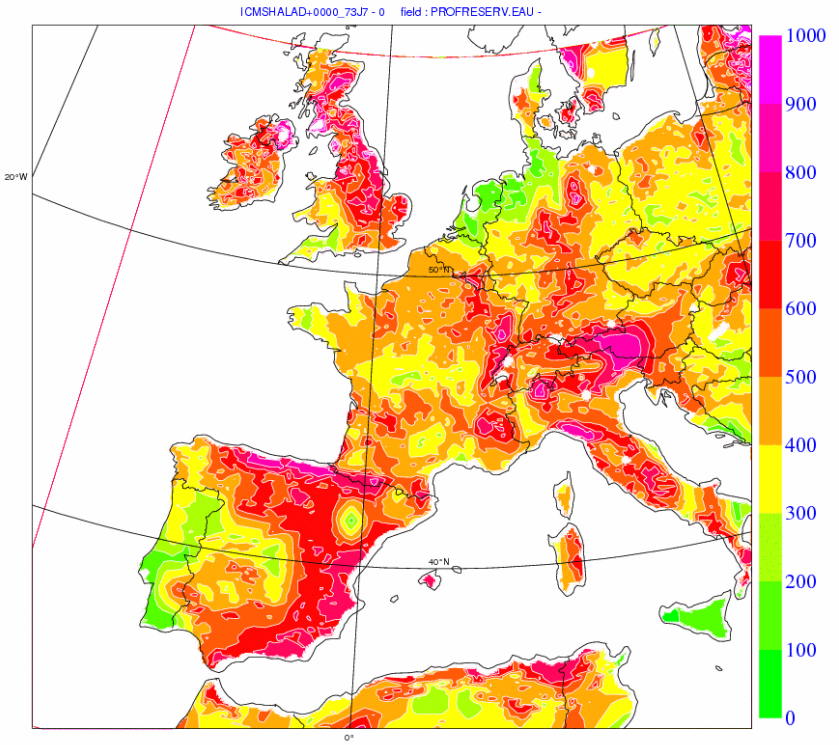
# Deep soil moisture reservoir analysis

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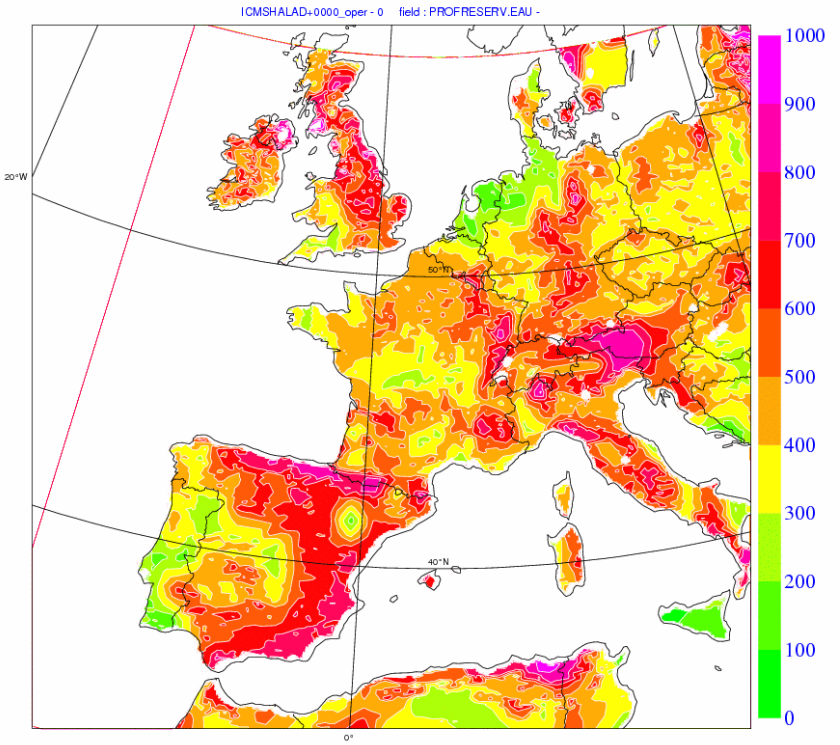


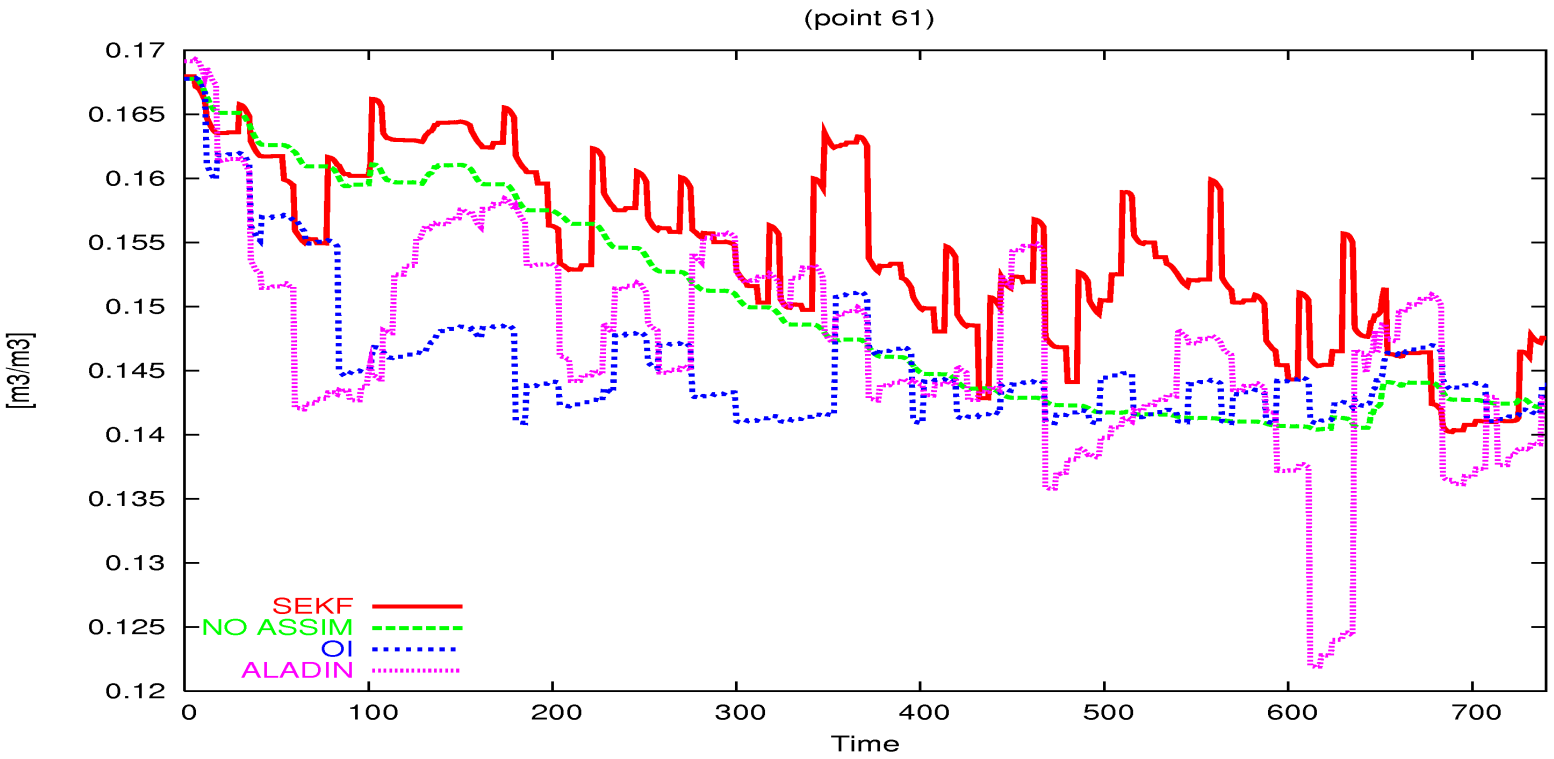

OPER

After one month of soil analysis

# OI soil analysis in SURFEX

- Motivations :
  - Provide a first soil analysis for AROME (already coupled to SURFEX)
  - Prepare the externalisation of the land data assimilation
  - Solve technical problems associated with the externalisation of the soil analysis without modifying the scientific aspects (two-step approach)
    - File formats of the «offline» SURFEX version
    - Inclusion of the «offline» SURFEX version within gmkpack environment
    - Coupling issues with the amospheric analysis
- Inclusion of the OI soil analysis in SURFEX library : done starting from the work of L. Taseva (externalisation of «cacsts»)
- Inclusion of read/write routine of LFI format files compatible with the «offline» version (in progress)

# Preliminary results




One month assimilation (July 2006)

Time series for a point located over Central France

**SEKF = Simplified Extended Kalman Filter**

**ALADIN = ARPEGE OI CANARI**

**OI = OI SURFEX**

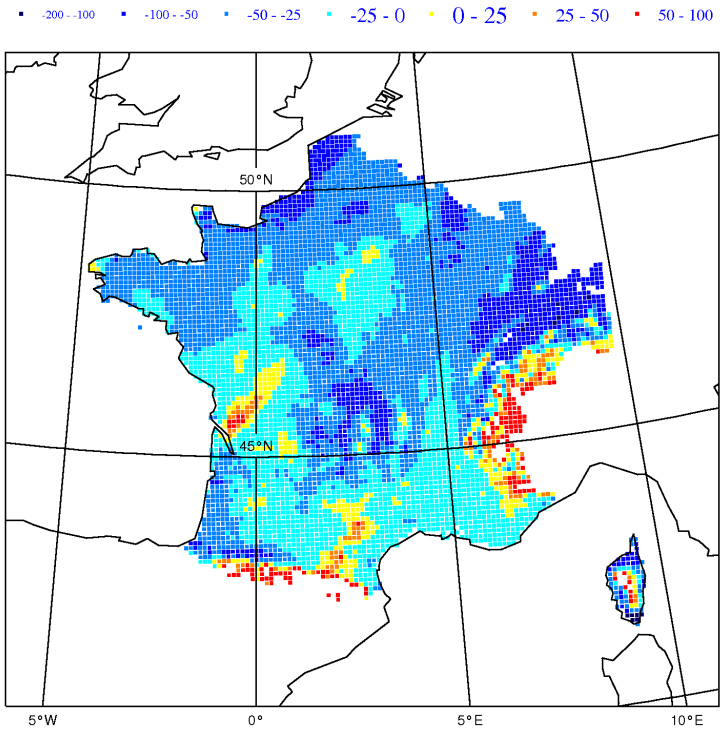
**NO ASSIM = Open loop run**

# EKF soil analysis in SURFEX

- Preliminary version developed by K. Bergaoui in spring 2007 with SURFEX v2 (presented in Dubrovnik Oct. 2007)
- Evolutions regarding consistency issues :
  - Use of climatological fields generated by E923 configuration
  - Use of SURFEX v3 that includes modifications in order to improve consistency with ALADIN :
    - Inclusion of orography component in ZOH
    - Minimum wind threshold
    - Transfer coefficients in the surface layer
- Evolution regarding the analysis system :
  - Control variable (wg, w2) instead of w2 only
  - Observations (T2m, RH2m, wg) instead of (T2m, RH2m)
  - Cycling of the B matrix

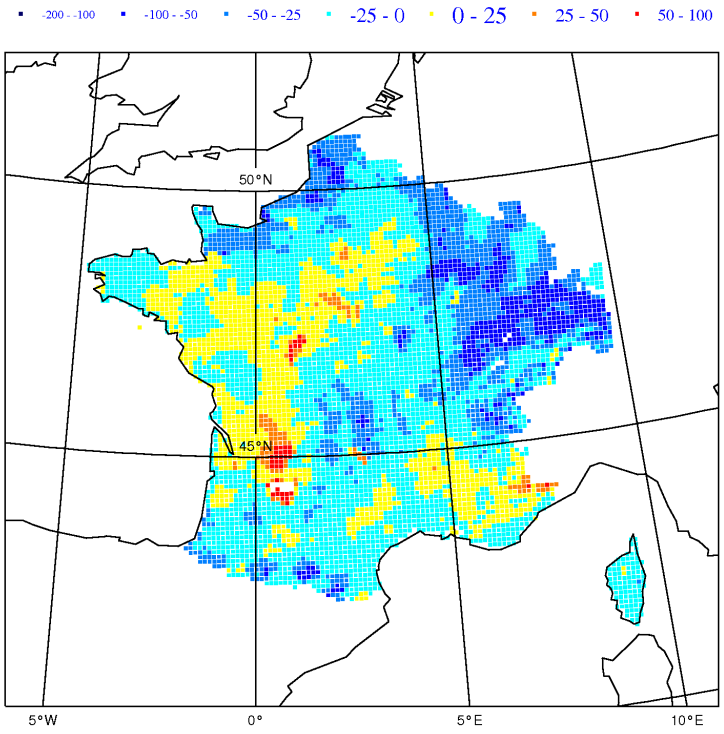
# Soil moisture evolution in July 2006 (1)

**SURFEX Soil moisture variations 30 - 01 July 2006 00Z**




SURFEX open loop

**SIM Soil moisture variations 30 - 01 July 2006 00Z**



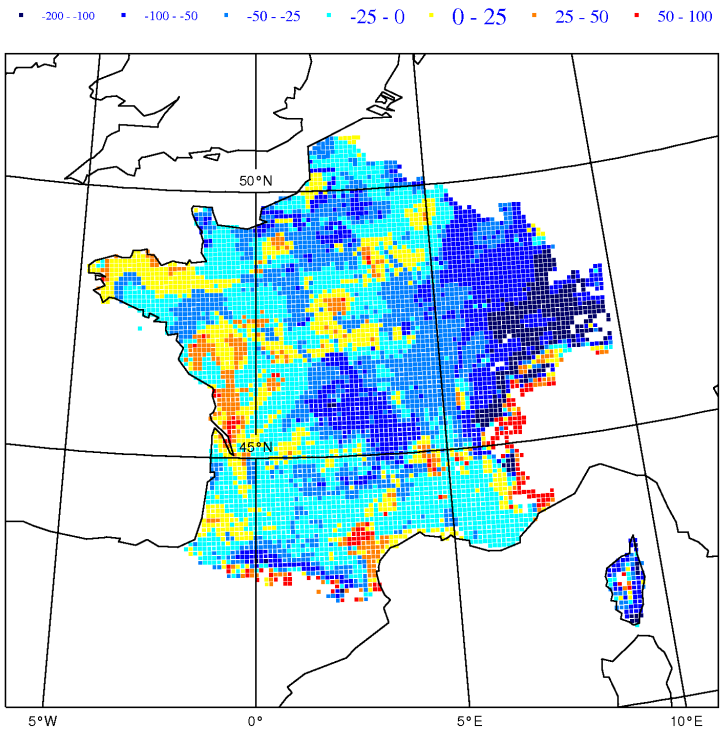

SIM

**blue for SM decrease**

**yellow/orange for SM increase**

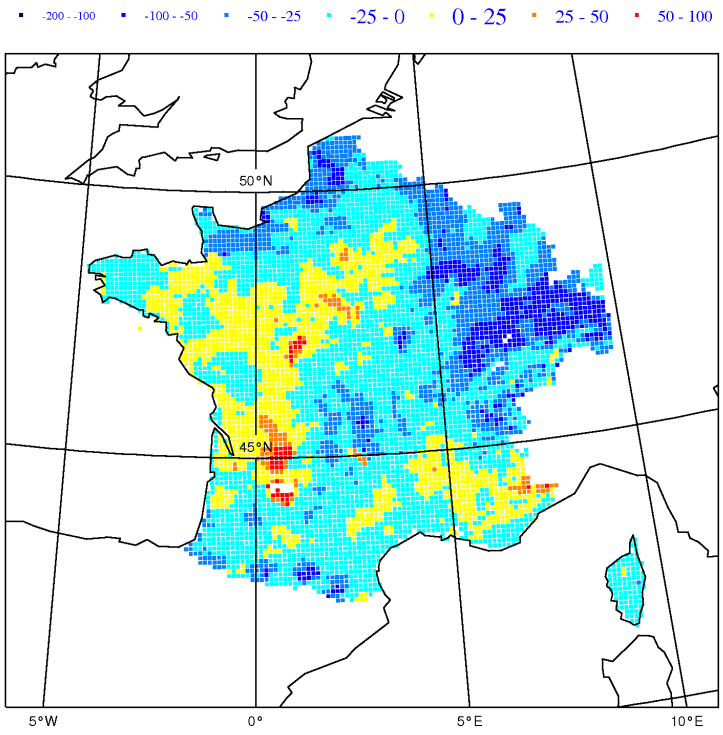
# Soil moisture evolution in July 2006 (2)

**SURFEX Soil moisture variations 30 - 01 July 2006 00Z**



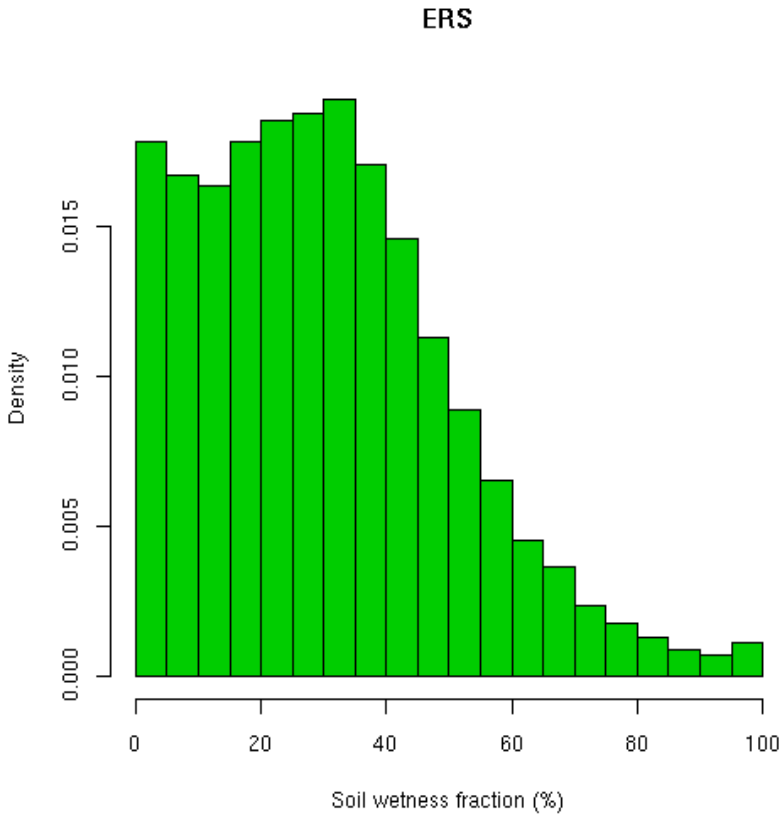

SURFEX SEKF

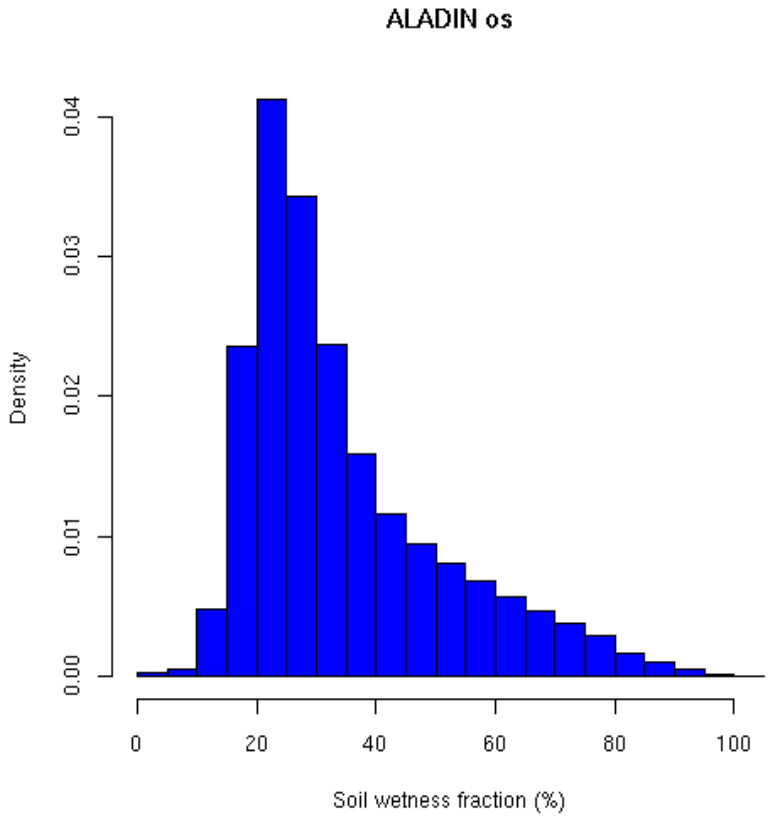
**SIM Soil moisture variations 30 - 01 July 2006 00Z**




SIM

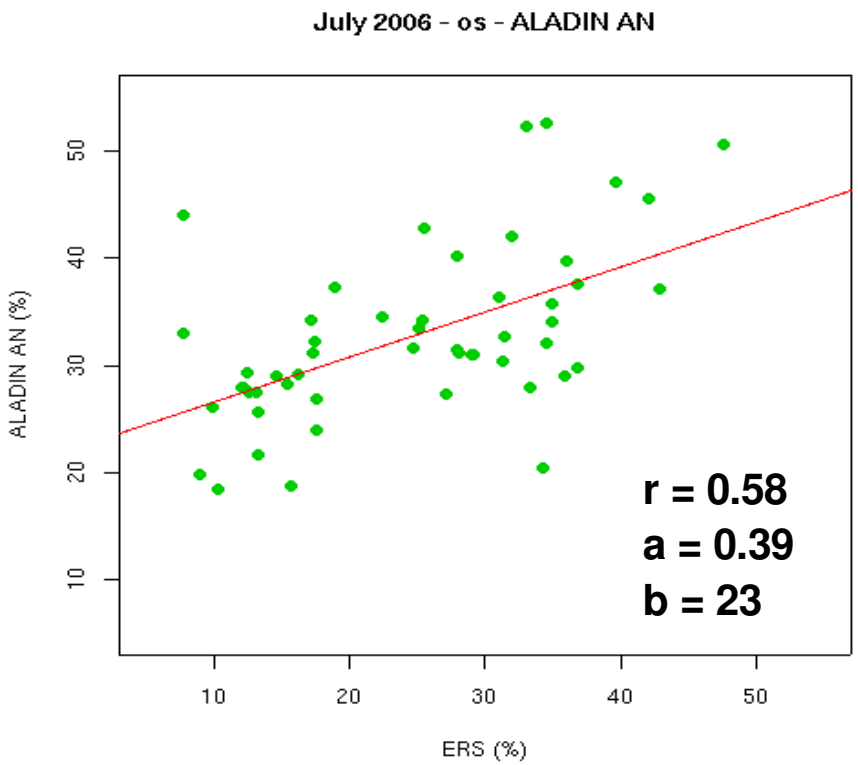
# Comparison ALADIN vs ERS soil moisture

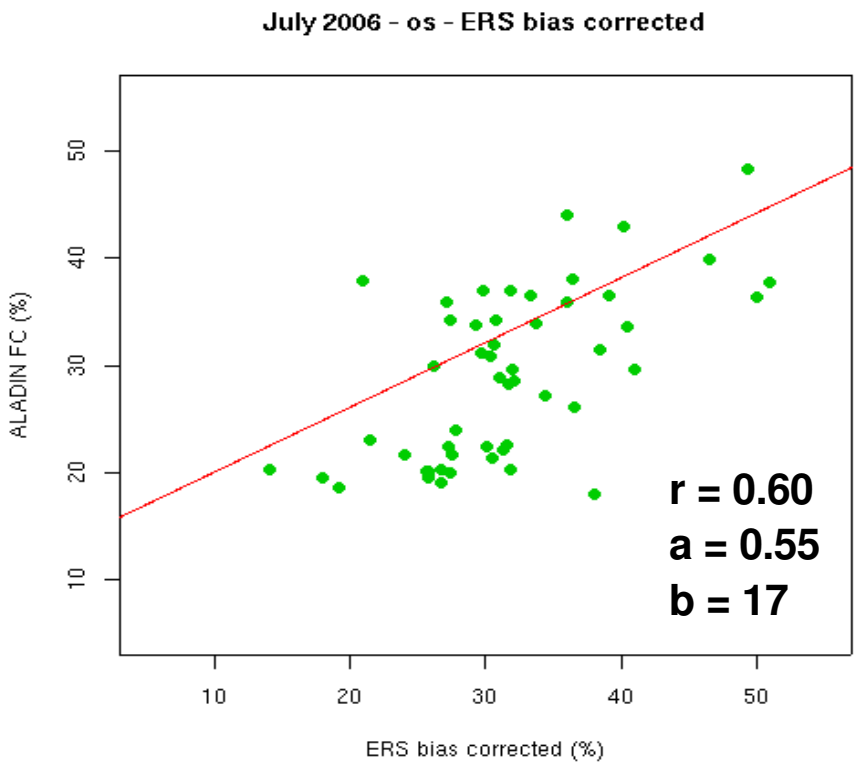



Superficial soil reservoir for July 2006 (in percent)
200 000 C-band scatterometer retrievals
From innovation statistics : $\sigma_o = \sigma_b = 0.06$ $m^3/m^3$

# ALADIN vs. bias corrected ERS



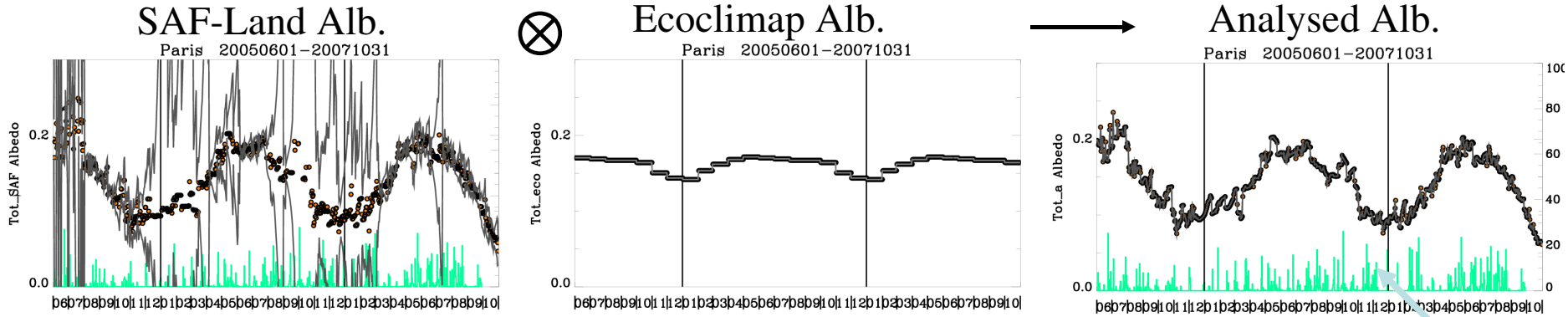

Bias correction : CDF matching technique

# Analysis of surface albedo

- Optimal combination of two sources of information :
  - LAND-SAF daily albedo derived from MSG (5 km)
  - ECOCLIMAP climatological albedo (1km)
- Technique : Kalman filter
- Resolution : 1km
- Observation operator :

$$\alpha_{tot} = (1 - veg)\,\alpha_{soil} + veg\,\alpha_{veg}$$

# Surface albedo analysis (1)




Time Series of surface albedo in Paris from June 2005 to october 2007

RR sat

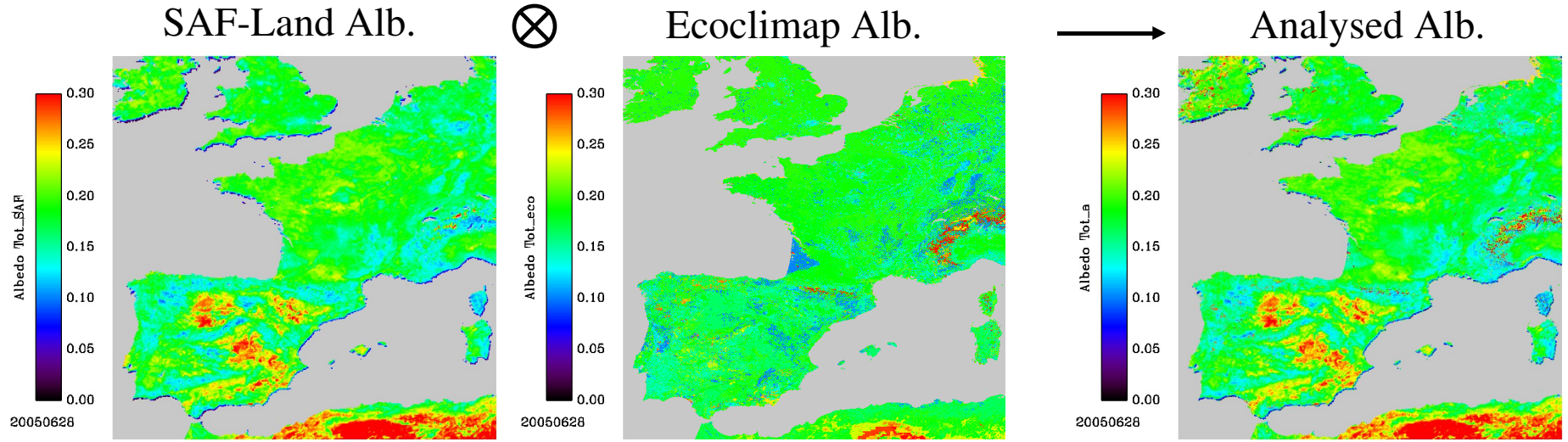



Image of daily surface albedo (20050628)

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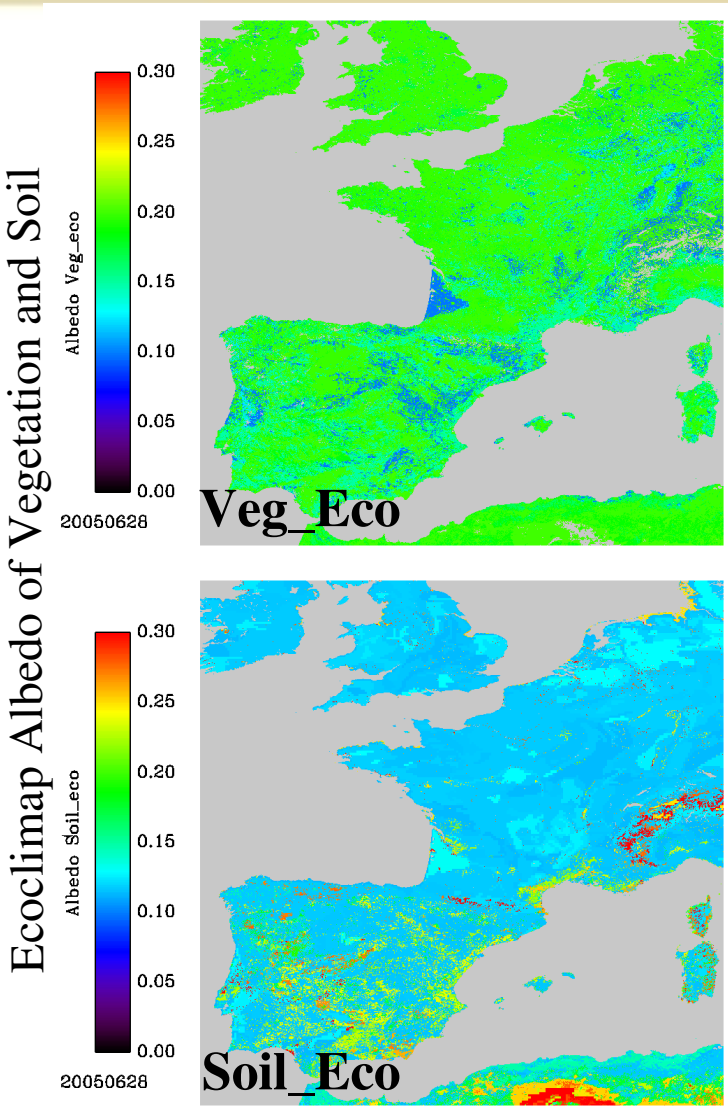
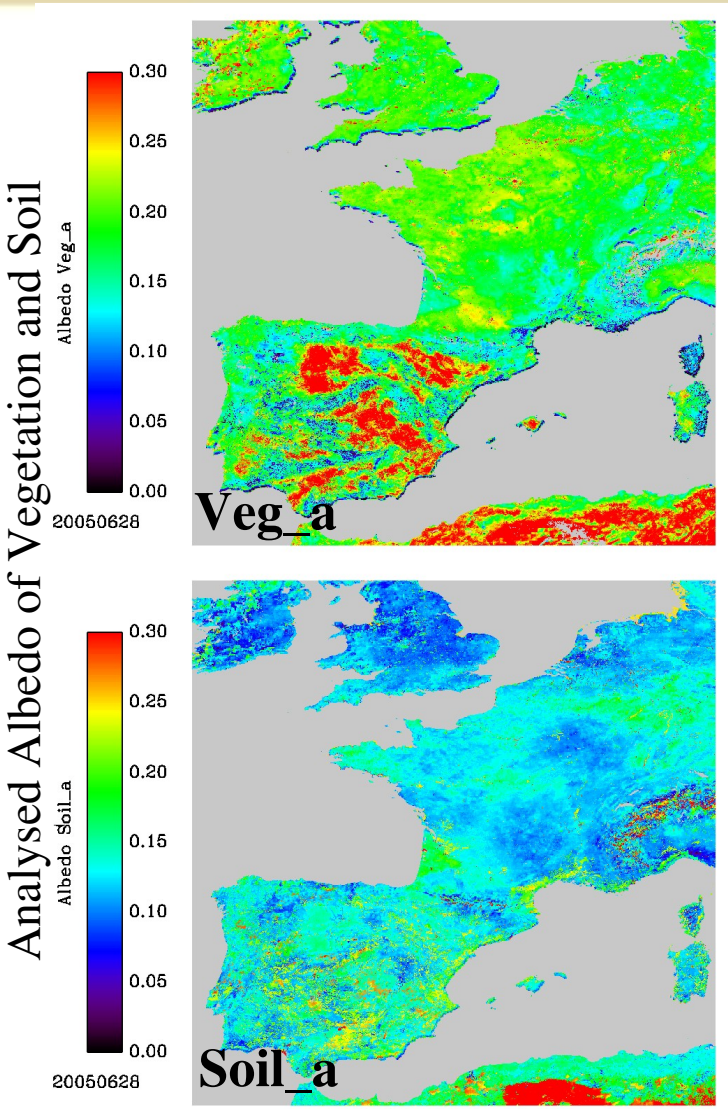
# Surface albedo analysis (2)




Date : 20050628

# Conclusions

- OI soil analysis in ALADIN-France : encouraging results – experimental suite soon
- Externalized land data assimilation in SURFEX :
  - Technically available for evaluation in AROME (end 2008)
  - Evaluation of vertical interpolation operators (RMI, HMS) with TL/AD
  - Evaluation in ALADIN possible in 2009
  - Use of improved radiative and precipitation forcing (R. Hamdi)
- Feasibility studies on EKF with satellite derived data (end 2008)
- Surface albedo analysis : collaboration with LACE for feasibility studies with ALADIN (J. Cedilnik)
- Collaborations with HIRLAM :
  - Evaluations of the EKF by H. The (KNMI) and M. Diez (INM)
  - Snow analysis in CANARI (end 2008)